

FACTORS TO BE REPORTED FOR SUSTAINABILITY REPORTING IN INDIAN CHEMICAL INDUSTRY– THE WAY INDUSTRY THINKS

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ABSTRACT

Caring for the environment has carved out a niche in the world culture. Corporate citizens have become aware and concerned of environmental, social and economic performance and their reporting to their stakeholders. Sustainability accounting and reporting has become a social discipline nowadays and cannot thrive in a vacuum. It has been enriched with various guidelines and standards. The sustainability reporting for Indian Chemical Industry is still at nascent stage but it can be used as a strategic weapon that will lead to prosper the industry through brand equity and goodwill. The approach of sustainability reporting is voluntary and has not been standardized by any statute of the state. The basic factors of reporting and their guidelines are there but a common framework is necessary. This paper focuses on what the Chemical Industry thinks about the factors to be reported through a consensus approach and tries to get a confirmation from the Indian Chemical Industry of the factors and the sub factors to be reported while reporting their performance on sustainability.

KEYWORDS: Sustainability, Sustainability Reporting, Human Aspect, Social Aspect, Natural Aspect, Economic Aspect and Financial Aspect

INTRODUCTION

A century ago India's natural resources were abundant in the form of cultivable lands, forests, grazing lands and minerals and above all clean air and clean water. Planned development started occurring from 1951 focusing a huge investment in Infrastructure and industrial development. This led to the growth of GDP and per capita GDP in manifolds which resulted in increased use of natural resource and finally enhanced resource degradation and rampant pollution. Economic growth means increase in GNP per capita but economic development as a term is qualitatively different and entails improvement and progress towards transformation of social and economic structures of society. Sustainable development means that this development can be sustained or maintained over time and for more than the usual political planning horizon of 5-10 years (**Hesselberg and Knutsen, 1994**). From 1960 the concept of sustainable development started emerging in African based conferences and later on in the Stockholm conference on the Human Environment in 1972. The concept was popularized further by World Commission for Environment and Development (WCED) in 1987. WCED report states that:"In essence , sustainable development is a process of change in which the exploitation of resources ,the direction of investments, the orientation of technological development, and institutional change all are in harmony and enhance both current and future potential to meet human needs and aspirations" (**WCED 1987,p.46**). In parallel with the emerging recognition of sustainability as a vital change for business of companies entering the 21st

century , sustainability reporting has evolved considerably (**Isenmann and Kim, 2005**). In recent years ,a rapidly increasing number of companies is publishing sustainability reports (**Kolk 2004**).In its report on International Survey of Corporate Sustainability Reporting KPMG defines sustainability reports as “reports that include quantitative and qualitative information on their on their financial/economic , social/ethical, and environmental performance in a balanced way”(**KPMG/WIMM 2002, 7**).

Indian Chemical Industry plays a significant role in economic growth of the country. This industry has an age old presence in India and has emerged as 6th largest in the world and 3rd largest in Asia by contributing immensely towards its economic progress (Source: **Report by DCPC, 2012**). In an attempt to depict the potential of the industry Ministry of Environment and Forests with Central Pollution Control Board has given some interesting facts. The contribution to the Indian GDP by the industry is 6.7 % and it is growing at about 11.5% (FY2009-10) also. The present turnover of the industry is about \$108 billion and accounts for 3.3% in terms of total volume of the world (Source: **FICCI, 2012**). As per the report prepared by KPMG the chemical industry shares 17.6% of manufacturing output , 13 to 14%of total exports , 8 to 9 % of total imports and 18 to 20% contribution to National Revenue by ways of various taxes. With the open up of economy for the 100% FDI (Foreign direct investment) and FII (Foreign Institutional investors) the monopoly enjoyed by those Govt. Enterprises got curtailed to some extent. The flow of capitals led to increase maximum number of SMEs (Small and Medium Sized Enterprises) in India especially in the states of Gujarat and Maharashtra (**Mitra and Ghosh 2013**). The rapid pace of globalization of markets abroad, and the economic liberalization within the country has indeed caught the chemical industry in India on wrong foot (**R Rajagopal 1995**). In every sphere of chemical industry be it dyestuff, pesticides or intermediaries many companies whether organized or unorganized are manufacturing and exporting chemicals in large quantities which are banned elsewhere (**R Rajagopal 1995**). Most of the chemicals are by very nature of their use become common contaminants of water air and food and also pass through some hazardous chemical process which ultimately affects the society and environment at large. Industrialization has created a host of technologies that uses chemicals such as cleaning agents. Pesticides, fuels, paints, medicines and some are used in many industrial processes. Human being comes to its exposure either by consumption of contaminated food and drink or through breathing of polluted air or by absorbing through skin or by accidents. Toxicity not only depends on exposure but on the dose of toxic substance absorbed by a sensitive organ.

When clubbed together economic, social and environmental performance of chemical industry constitutes the sustainability of Chemical Industry. A growing awareness has come out both internally and externally that the long term survival of the industry depends upon improving its economic, social and environmental sustainability (**CIA, 2004; Chemistry Leadership Council, 2005**). “**Sustainability is a path of continuous improvement, wherein the products and services required by society are delivered with progressively less negative impact upon the Earth**” as defined by AIChE Institute for Sustainability November ‘04-July ‘05 Grassroots Project, Earl Beaver, Chair IFS. Morhardt, Baird, and Freeman (2002, 215 f).

The sustainability reporting for chemical industry is at a nascent stage in India. Number of chemical companies reporting the Sustainability Reporting is only 14 (Source: Trends of Sustainability reporting in India). The sustainability reporting is not a mandatory affair it is a voluntary disclosure at present. The industry is mostly infested by Small and Medium Scale Enterprises (SME) which are basically catering only to some environmental statutes. When the industry gets populated by SMEs it starts feeling pressure of more environmental performance and the managers must develop an understanding of the circumstances that influence the success of implementing and promoting organizational changes that fosters superior environmental performance among SMEs (Mark Cordano Et al 2010). So the development of a deep

thought and believe and understanding of sustainability reporting is necessary. Since it is a voluntary disclosure a common framework and consensus over reporting from the industry is the need of the hour. Voluntary initiatives can foster industry and firm specific innovations to achieve environmental performance goals (Koski and May, 2006).

In this study the researchers try to find out the factors that needs to be reported through sustainability reporting derived through a common consensus from the industry decision makers which will create a stepping stone for the industry to think and reorient itself towards sustainability reporting in a simplified manner.

LITERATURE REVIEW

An extensive literature review has been conducted to identify the major aspects of sustainability reporting and their sub factors. The five major factors were found are Human Aspects, Social Aspects, Natural Aspects, Economic Aspects and Financial Aspects. A brief review of these prime aspects are described below.

As mentioned in the Human Development Report 2013 prepared by UNDP human aspect was said to have an enduring relevance in making sense of our world and addressing challenges now and in the future. The report discussed the concept of human development and emphasized how equity, empowerment and sustainability expand people's choices. People who are in disadvantageous position always remained as a central focus of human development which includes the people in the future who will suffer the most severe consequences of the risks arising from the activity today.

Sustainable human development is the expansion of the substantive freedoms of people today while making reasonable efforts to avoid seriously compromising those of future generations (**Human Development Report 2013, UNDP**).

The contribution towards the following areas of human aspects demands a holistic approach for making a sustainability reporting by a company. Development of "people" means providing a fair and beneficial business practices towards the labour and community and region in which a corporation conducts its business. So a company reporting a sustainability report should conceive a reciprocal social structure in which the well being of corporate must be interdependent with labour and other stakeholders' interest (**Brown and Marshall, 2006**).

While talking about social aspects a good corporate governance means a business practice influenced by social responsibility of the organization which means showing a sensitivity towards societal issues by corporate entities. According to the Western Australia Council of Social Services *social sustainability occurs when the formal and informal processes; systems; structures; and relationships actively support the capacity of current and future generations to create healthy and livable communities. Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life*. Social security can be a public good as it will strengthen the economic productivity. Since this stability can be enjoyed by everyone without own contributions as long as someone else provides some kind of social security system, individuals find them in social dilemma (**Meyer, 2000**). Several methods are available for reporting the contributions made by the companies to report on their social obligations. United Nations Global Compact and Global Reporting Framework have taken major initiatives in this front. Considering the social dimensions most of the companies describe their efforts towards social progress by improving literacy, providing safe drinking water, building roads and hospitals, introducing relief efforts, developing communities and forming networks (**CAG Report No.9 on PSU, 2007**).

Ecosystem and our natural environment constitute the platform upon which our entire existence is based (**Costanza et al, 1997**). When the ecosystem is healthy it becomes a vital goods and service provider for humans and other organisms. A two fold problem negative human impact and degraded ecosystem services can be generated from the

environmental pollutions made by the industries. To tackle this environmental management consisting of earth science, environmental science and conservation biology will help restoring the ecosystem services and reducing the negative human impact on the one front and on the other front there must be a demand management of natural resources used by human to reduce the depletion of natural capital. Biodiversity restoration and greening the supply chain has become a popular agenda for the sustainable development at United Nation Environment Program. Biodiversity is simply defined as the variety of life on earth. The research conducted by UNEP shows that the species collectively have lost two third of their historic ranges due to human activities which represents a significant loss of ecosystem capital (**Global Biodiversity Outlook, 2001**). Because ecosystem capital is of infinite value to human enterprises , the pathway to a sustainable future depends on protecting wild species that make ecosystems work (**Wright,2007**).The supply chain consist of all parties who are involved in fulfilling a customer request including the suppliers, transporters, warehouses, retailers and customer themselves (**Cox, 1999**).The most common Green supply Chain management practices involve organizations assessing the environmental performance of their suppliers, requiring suppliers requiring suppliers to undertake measures that ensure environmental quality of their products and evaluating the cost of waste in their operating systems (**Handfield et al, 2002**).

Economic aspect of sustainability is most elusive component of triple bottom line (Economics, Environment and Equity) approach. There is not even universal consensus that businesses should be economically sustainable, though most concur that sustainability is desirable to prevent the devastating and inefficient impacts of corporate premature death (**Doane & MacGillivray, 2001**). Most companies are concerned not only with their immediate financial performance but with their ability to continue long into the future being a player able to make positive contributions to their local community, broader society and planet as a whole (**Doane & MacGillivray, 2001**). A sustainable economy is always known by a wide range of well known indicators like regional development, price stabilization, labour market and employment statistics. Inclusive growth always put stress on creating different jobs. Productive and decent employment opportunities create income security and paves the way for broader social and economic advancement, strengthening individuals, their families and communities (**UN,2012**). Price stabilization is also an important aspect here which allows a substantial reduction of the effects of the business cycle on the profits of chemical companies through various risk reduction measures and by creating a strong link between input cost and output prices.

As sustainable development emerged in 1990 initially it was seen as a shift from the traditional view that talks about only one bottom line financial. The rising importance of sustainable development issues is seen in the growing interest of investors and lenders. Financial aspects of sustainable development extends its area towards shareholders' value creation and livelihood generation also. Sustainable business practices contributes to shareholders' value in a broader and more strategic way –by strengthening brand equity , reputation, human capital, alliances and other important intangibles that can account for upto 90% of a firm's market value (**Fiksel et al,2004**). Income generation activities is also an important aspect in sustainable reporting area to help vulnerable population cover their basic needs and food supplies in a sustainable manner through the income they produce. The programme should permit an improvement in the families' economic situation through an increase in the household's purchasing power (**ACF International, 2009**).

Further to these five major factors the sub factors under the above mentioned broad categories were also identified through different literature survey of different reporting frameworks like Global Reporting Framework, International Financial Reporting System, Institute of Chartered Accountants of India and also some published sustainability reports by different companies at national and international level. The structure of those factors and their sub items is represented in the below mentioned chart.

Table 1: Common Factors for Sustainability Reporting Framework Identified through Literature Review

Common Factors for SRF Identified				
HA1 to HA7	SA1 to SA7	NA1 to NA5	EA1 to EA4	FA1 to FA3
Human Aspect	Social Aspect	Natural Aspect	Economic Aspect	Financial Aspect
Development of Employee	Stakeholder Engagement	Biodiversity Restoration	Improve Employability	Income Enhancement
Healthy People	Enhancing Capacity	Greening supply chain	Regional Development	Enhancing Shareholder Value
Educated Population	Building Community	Management of Scarce Resources	Price Stabilization	Livelihood Generation
Active Volunteering	Creating Educational Institution	Environmental Conservation	Employment Generation	
Youth and Leadership	Forming Networks	Wildlife Protection		
Artisan & Entrepreneurship Development	Improving Health Care & Sanitation			
Stakeholder Accountability	Supply Chain as base of Pyramid			

Source: GRI Framework and FRS

RESEARCH METHODOLOGY

The methodology that was used in this study involved a three stage process. Stage one was consisted of in depth interview with the industry experts in the Chemical Industry of Gujarat to examine the validity of questionnaire. A questionnaire was developed after the interview and literature survey.

Stage two was completed by a pilot survey taking 40 questionnaire filled up by the industry personnel from different locations. Validity and reliability test was conducted to finalise the questionnaire for further survey after some minor modifications. The Chronbach's Alpha score as mentioned in Table 2 was more than 70% .which indicated that the questionnaire was highly reliable.

Table 2: Reliability Score for the Questionnaire

Factors	Cronbach's Alpha	No. of Items
Human Aspects	0.871	7
Social Aspects	0.936	6
Natural Aspects	0.917	5
Economic Aspects	0.903	4
Financial Aspects	0.701	3

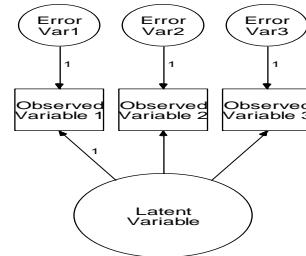
In the third stage the final structured questionnaire which was developed on Likert Scale by following ranking methods (ranging from 1 to 7 where 1 was given to top priority and 7 as least priority) to know the preferences of the respondents towards the factors for reporting.

The total number of respondents was 520 across the Gujarat and majority of them was the decision makers in their organizations for the performance reporting of the company. The sampling method used was convenient sampling. The data was analysed by using Confirmatory Factor Analysis. Confirmatory factor analysis (CFA) tests whether a specified set of constructs is influencing responses in a predicted way. CFA requires a priori specification based on hypothesis.

Table 3: Representation of Confirmatory Factor Analysis

Confirmatory Factor Analysis

- Representation in SEM**
 - Latent variable represented by a circle
 - Measured variables (indicators) represented by a square
 - Each indicator variable has an error term
- CFA Initial Specification**
 - Each variable loads on one and only one factor
 - Factors can (and typically are) correlated
 - Errors across indicator variables are independent
- Assumptions**
 - The factors are uncorrelated with the measurement errors
 - Most (if not all) of the errors of different indicators are uncorrelated with each other



Latest version of statistical software AMOS Graphics was used for Structural Equation modeling. Goodness of Fit and RMSEA measures were used to describe the model fit.

Discussion and Statistical Inference

Before data analysis the hypothesis was framed as follows

H₀

Sustainability Reporting model is a Five-Factor Structure.

H₁

Sustainability Reporting model is not a Five-Factor Structure.

The model to be tested in Hypothesis postulates a priori that Sustainability Reporting is a Five-factor structure composed of the Human Aspects, Social Aspects, Natural Aspects, Economic Aspects and Financial Aspects. The Sustainability Reporting Model is a 26-item instrument structured on a 7-point scale that ranges from **where 1 stands for the maximum priority and 7 is the least priority**. The component parts of the model are as follows.

- There are five Sustainability Reporting factors, as indicated by the five ellipses labeled Human Aspects, Social Aspects, Natural Aspects, Economic Aspects and Financial Aspects.
- The five factors are inter correlated, as indicated by the two-headed arrows.
- There are 26 observed variables, as indicated by the 26 rectangles (From HA_1 to FA_3)
- The observed variables load on the factors in the following pattern:
- HA_1 to HA_7 load on Human Aspects, SA_1 to SA_7 load on Social Aspects and NA_1 to NA_5 load on Natural Aspects, EA_1 to EA_4 load on Economic Aspects and FA_1 to FA_3 load on Financial Aspects.
- Each observed variable loads on one and only one factor.
- Errors of measurement associated with each observed variable (err01–err26) are uncorrelated.

Observations Farthest from the Centroid (Mahalanobis Distance) (Group Number 1)

Modelling with AMOS Graphics

The hypothesized five-factor model of Sustainability Reporting

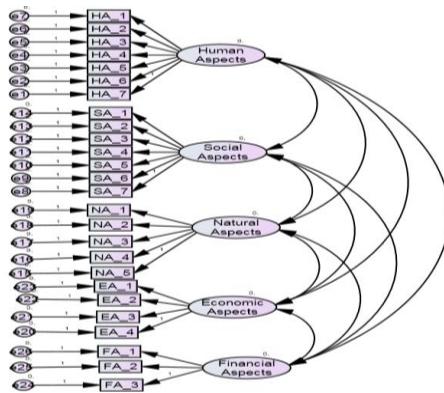


Figure 1: The Specification of Input for Analyses Using AMOS Graphics

Model Summary

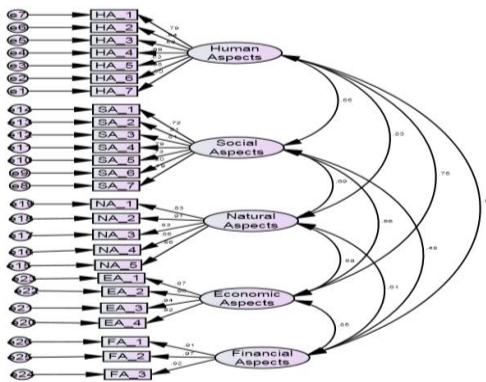


Figure 2: Estimated Five – Factor Model of Corporate Governance (Standardized Estimate)

Model Fit Summary

CMIN

Table 3

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	88	1447.258	289	.000	5.008

Focusing on the first set of fit statistics, we see the labels NPAR (number of parameters), CMIN (minimum discrepancy), DF (degrees of freedom), P (probability value), and CMIN/DF. The value of 1447.258 under CMIN, represents the discrepancy between the unrestricted sample covariance matrix S, and the restricted covariance matrix $\Sigma(\theta)$, and, in essence, represents the Likelihood Ratio Test statistic, most commonly expressed as a χ^2 statistic. The test of H_0 , that Sustainability Reporting is five-factor structure as depicted in Figure yielded a χ^2 value of 1447.258, with 289 degrees of freedom and a probability of less than .01 ($p < .01$), thereby suggesting that the fit of the data to the hypothesized model is not entirely adequate.

However, both the sensitivity of the Likelihood Ratio Test to sample size and its basis on the central χ^2 distribution, which assumes that the model fits perfectly in the population (i.e., that H_0 is correct), have led to problems of fit that are now widely known. Because the χ^2 statistic equals $(N-1) F_{\min}$, this value tends to be substantial when the model does *not* hold and when sample size is large (Joreskog & Sorbom, 1993). Yet, the analysis of covariance structures is grounded in large sample theory.

Thus, findings of well-fitting hypothesized models, where the χ^2 value approximates the degrees of freedom, have proven to be unrealistic in most SEM empirical research. More common are findings of a large χ^2 relative to degrees of freedom, thereby indicating a need to modify the model in order to better fit the data (**Joreskog & Sorbom, 1993**).

Thus, results related to the test of hypothesized model are not unexpected. Indeed, given this problematic aspect of the Likelihood Ratio Test, and the fact that postulated models (no matter how good) can only ever fit real-world data approximately and never exactly.

One of the first fit statistics to address this problem was the $\chi^2/\text{degrees of freedom}$ ratio (**Wheaton, Muthen, Alwin, & Summers, 1977**), which appears as CMIN/DF is 5.008 (Standard Recommended value is $<= 5$).

Baseline Comparisons

Table 4

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default Model	.857	.827	.883	.857	.882

The next set of goodness-of-fit statistics (baseline comparisons), which can be classified as incremental or comparative indices of fit (**Hu & Bentler, 1995**; **Marsh et al., 1988**). However, addressing evidence that the NFI has shown a tendency to underestimate fit in small samples, **Bentler (1990)** revised the NFI to take sample size into account and proposed the Comparative Fit Index (CFI). Values for both the NFI and CFI range from zero to 1.00 and are derived from the comparison of a hypothesized model with the independence (or null) model. As such, each provides a measure of complete covariation in the data. Although a value $> .90$ is considered representative of a well-fitting model (**Bentler, 1992**). In this case the value is 0.882 indicating the moderate fit of the model. The Relative Fit Index (**RFI**; **Bollen, 1986**) represents a derivative of the NFI; as with both the NFI and CFI, the RFI coefficient values range from zero to 1.00, with values close to .95 indicating superior fit (**Hu & Bentler, 1999**). In this case the value is 0.827 indicating the moderate fit of the model.

RMSEA

Table 5

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.088	.083	.092	.000

The next set of fit statistics focuses on the root mean square error of approximation (RMSEA). Although this index, and the conceptual framework within which it is embedded, was first proposed by Steiger and Lind in 1980, it has only recently been recognized as one of the most informative criteria in covariance structure modeling. The RMSEA takes into account the error of approximation in the population and asks the question “How well would the model, with unknown but optimally chosen parameter values, fit the population covariance matrix if it were available?” (**Browne & Cudeck, 1993, pp. 137–138**). This discrepancy, as measured by the RMSEA, is expressed per degree of freedom, thus making it sensitive to the number of estimated parameters in the model (i.e., the complexity of the model); values less than .05 indicate good fit, and values as high as .08 represent reasonable errors of approximation in the population (**Browne & Cudeck, 1993**). **MacCallum et al. (1996)** have recently elaborated on these cut points and noted that RMSEA values ranging from .08 to .10 indicate mediocre fit, and those greater than .10 indicate poor fit. Although **Hu and Bentler (1999)** have suggested a value of .06 to be indicative of good fit between the hypothesized model and the observed data, they cautioned that, when sample size is small, the RMSEA (and TLI) tend to over reject true population models. In this case the value of RMSEA is 0.088 indicate mediocre fit of model.

Thus, on the basis of our goodness-of-fit results, it can be concluded that the hypothesized Five-factor CFA model moderately fit the sample data.

Standardized Regression Weights: (Group Number 1 - Default Model)

The table below shows the standardized regression weights. The value above 0.7 indicates reasonable amount of variance can be extracted from the variable. Majority of the regression weights are greater than 0.7. Again 5 variables of human aspects are having regression weight less than 0.7 indicating poor representative of the construct – Human Aspects.

Table 6: Standardized Regression Estimates

			Estimate
HA_7	<---	Human_Aspects	.600
HA_6	<---	Human_Aspects	.583
HA_5	<---	Human_Aspects	.534
HA_4	<---	Human_Aspects	.694
HA_3	<---	Human_Aspects	.561
HA_2	<---	Human_Aspects	.843
HA_1	<---	Human_Aspects	.791
SA_7	<---	Social_Aspects	.786
SA_6	<---	Social_Aspects	.196
SA_5	<---	Social_Aspects	.732
SA_4	<---	Social_Aspects	.793
SA_3	<---	Social_Aspects	.808
SA_2	<---	Social_Aspects	.814
SA_1	<---	Social_Aspects	.716
NA_5	<---	Natural_Aspects	.863
NA_4	<---	Natural_Aspects	.864
NA_3	<---	Natural_Aspects	.830
NA_2	<---	Natural_Aspects	.910
NA_1	<---	Natural_Aspects	.833
EA_4	<---	Economic_Aspects	.916
EA_3	<---	Economic_Aspects	.940
EA_2	<---	Economic_Aspects	.905
EA_1	<---	Economic_Aspects	.866
FA_3	<---	Financial_Aspects	.917
FA_2	<---	Financial_Aspects	.972
FA_1	<---	Financial_Aspects	.907

Thus, on the basis of goodness-of-fit results, it can be concluded that the hypothesized Five-factor CFA model moderately fit the sample data. The average variance of factor loading was also extracted. Average Variance of 0.5 or high is a good rule of thumb suggesting adequate convergence. The following table shows the average variance extracted from different factors.

Table 7: Factor Wise Average Variance Extracted

Name of the Factors	Average Variance Extracted
Human Factors	0.44
Social Factors	0.52
Natural Factors	0.74
Economic Factors	0.82
Finance Factor	0.86

CONCLUSIONS

Classical Variance analysis for balanced data does the following things at once. As exploratory data analysis, variance helps in an additive data decomposition, and its sums of squares indicate the variance of each component of the decomposition (or, equivalently, each set of terms of a linear model).

Comparisons of mean squares, allow testing of a nested sequence of models. Closely related to the variance analysis is a linear model fit with coefficient estimates and standard errors. It is computationally elegant and relatively robust against violations of its assumptions. It provides industrial strength (multiple sample comparison) statistical analysis.

It has been adapted to the analysis of a variety of useful propositions like introduction of various new concepts like sustainability reporting, abolition of child labour, saving fuel consumption etc. It gives us fairly good fit of normality if the variability is less, which means the adaptation has been quite successful.

It has also been seen that variance technique enjoyed the status of being the **most used** statistical technique in psychological research.

General interpretation that has been used in this study is as follows:

As the scatteredness is more, it is not a good fit of Balanced Normal concept. (Source –Google Pictures)

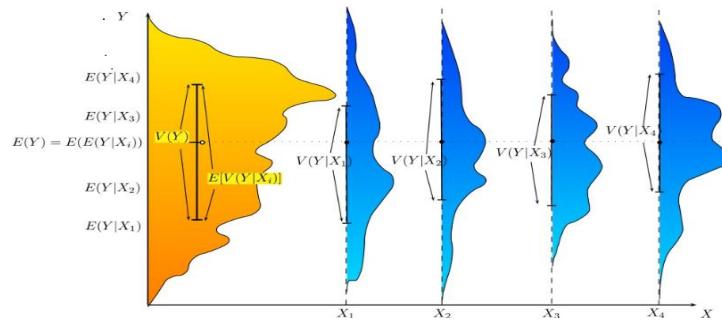


Figure 3

As the scatteredness is less scattered, it is fairly good fit of Balanced Normal concept (Source :- Google Picture).

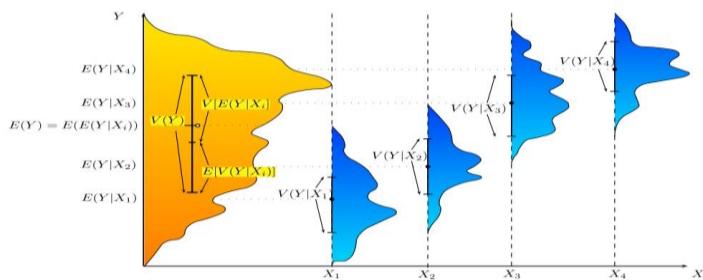
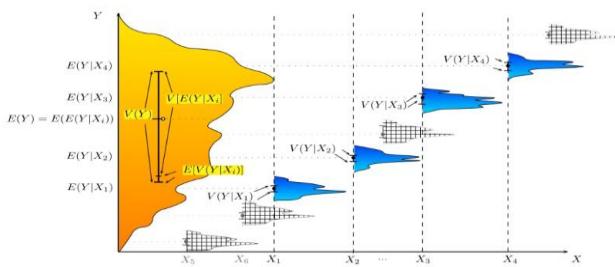


Figure 4

As the scatteredness is very less, it is a very good fit of Balanced Normal concept (Source :-Google Picture).

**Figure 5**

As it can be seen that the factors those are arranged in ascending order of variance magnitude, clearly shows that more the human factor, less the variance but more the finance factor, more is the variance. It can be inferred that, though the human being feels that adaptation is essential for the betterment of the society, the financial constraints keep the adaptation process a little delayed. It may take a little time, but the average variance in the long run is expected to be homogeneous.

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